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ABSTRACT

The Computer-Managed Education Technology (COMET) program was designed to improve group instruction through the use of technological aids in the classroom. Specific objectives included: (1) improving feedback on student comprehension during a class period; (2) facilitating the administration and grading of homework and quizzes; (3) providing for use of multimedia equipment; and (4) providing effective methods for student self-study for remedial purposes. Two classrooms and supplementary facilities were equipped with a student response system (SRS); five audiovisual response (AVR) stations; multimedia equipment; minicomputer (NOVA 840); and a card reader and line printer for inputting data and retrieval of print outs from the computer. The courses taught using the COMET facilities were mostly technical or skills oriented and primarily involved lower classmen in introductory or developmental classes. Sixteen instructors and six classes were administered questionnaires designed to measure: (1) degree of program implementation; (2) accuracy, speed, and ease of use of various hardware and software components; and (3) teacher and student reactions to the program. The SRS was found to be a valuable instructional aid; however, the AVR stations, multimedia equipment, and computerized capabilities of the program received little usage. Questionnaires are appended. (JPF)

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AN EVALUATION OF COMPUTER-MANAGED EDUCATION TECHNOLOGY AT NEW YORK CITY COMMUNITY COLLEGE

Linda Chitayat

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Linda Chitayat

The evaluation activity described herein was performed pursuant to a contract awarded by New York City Community College. Beyond presentation of factual data, the points of view or opinions stated are those of the author, and are the responsibility of the Institute for Research and Development in Occupational Education as the third party evaluator.

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PROGRAM OBJECTIVES

The Computer-Managed Education Technology (COMET) program was initiated at New York City Community College in the fall of 1973. Its broad goal was to provide more effective, responsive group instruction through the use of some of today's newer electronic resources. More specifically, the program was intended to (1) improve feedback on student comprehension during a class period, (2) facilitate the administration and grading of homework and quizzes, (3) provide for the use of multimedia in the classroom, and (4) provide effective methods of student self-study for remedial purposes.

To achieve these objectives, electronic equipment was purchased, and ancillary materials developed or purchased to enable:[1]

- Immediate polling of student responses at any time during a classroom period, so that students could better evaluate their comprehension, and instructors could modify their teaching to accommodate student needs.
- Homework and quiz grading "automatically" by computer.
- Computer-generated homework and quizzes from item pools developed by instructors.
- Computer-generated Teacher Reports consisting of scores for all students on class quizzes, homework, and self-study modules; and Student Reports containing all scores for an individual student. The Teacher Reports would provide teachers easily with an overall view, by question, of how students performed; while the Student Report would provide each individual student with his scores.
- Computer-generated prescriptions for students' remedial study.
- Independent self-study special audio-visual stations for students who have been identified as needing remedial work.
- The use of multimedia equipment with appropriate "educational software" (e.g., tapes, transparencies, films, etc.) in the classroom.

PROGRAM SITE

COMET operates in the technologies building on the New York City Community College campus. All COMET classes are held in one of two adjacent classrooms, each equipped with the Student Response System (SRS). This system permits

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[1] One last function, computer-generated statistical analysis, was in the original program design before modification.

students to respond to multiple choice questions by pushing individual buttons at their seats, and summarizes these responses on a teacher's console at the front of the room. The two COMET classrooms are also equipped with multimedia equipment: one classroom has rear-screen 16mm and 8mm film projectors, and overhead projector, and videotape recorder permanently installed; the other classroom has its own portable videotape recorder.

Directly across from the two COMET classrooms is the Computer Room, which houses the mini-computer that operates all of COMET's computer-related functions. Also in this room are the card reader and line printer which were purchased for inputting data and retrieving printed output from the computer.

The Technology Learning Center, located several floors below the COMET complex, serves as the location for the five Audio-Visual Response (AVR) stations which permit students to study independently, given specially prepared interactive slide-and-tape lessons. The Technology Learning Center was established independently of COMET to serve as a place where students can come to work individually on topics in which they are weak. Students come either on their own intitiative, on the advice of an instructor, or as part of a remedial or "developmental" course. The Center has a number of individualized lessons available for students, mostly using paper and pencil. It was felt that the AVR's were best suited to this Center, where students are aware they can drop in for help.

DESCRIPTION OF COMET COMPONENTS: HARDWARE, SOFTWARE, STAFFING

Hardware

Most COMET hardware--i.e., the electronic equipment required--was installed and functional by October 1973, although the development of its potential in terms of the stated objectives was necessarily a longer process.

As was stated, those COMET functions which require a computer are run on a mini-computer purchased for this project, more specifically a NOVA 840. This machine can be used to record student responses on the Student Response System and on the Audio-Visual Response stations, and is used also for grading and generating homework assignments and quizzes. Whereas the SRS and AVR's may be directly connected to the computer, homework and quiz responses are put on mark-sense cards and fed into the computer by means of a card reader. A line printer was purchased as well to enable computer output to be retrieved on paper of standard letter size.

The two COMET classrooms are equipped with the Student Response System -1000,

purchased from Instructional Industries, Inc. The SRS consists of student stations (30 in Room A and 36 in Room B) and an instructor's console at the front of the room (see Figures 1 and 2). A student seated at his station has a palm-sized unit permanently affixed to the desk near his seat. This unit contains a small calculator-type screen large enough to project one digit; and five buttons numbered 1-5. The student responds to a multiple choice question by pressing the appropriate button, and his choice is illuminated on his small screen. A response may be "cancelled" by pressing a special sixth button, at which point the student may again press one of the numbered keys.

These responses are automatically translated into the proportion of students in the class selecting choice #1, 2, 3, 4, and 5. These percentages appear on the instructor's console on the five different meters corresponding to each choice. The total percentage of students responding appears on a sixth meter. It should be noted that the instructor first "calibrates" the system by having all students press some response, and then setting the "Total" meter to indicate 100%. Thus, where the instructor poses a multiple choice question, the sum of proportions of responses for each choice will either equal 100%, if all students responded in some way, or indicate the total proportion of students who acutally did respond.

Some variations are possible in terms of question-posing. The instructor may key in the correct response at the console, in which case a correct response entered by a student will flash on and off on the screen at his station. The instructor may also give students a specific amount of time in which to select their responses before they can no long be changed.

The SRS is on-line to the mini-computer, so that responses may be recorded and later retrieved from the computer, if the instructor depresses a "record" button on his console. A printed copy may then be requested, containing the question number (the instructor can indicate this on the console) followed by a row of digits corresponding to the student reponses printed in a specific sequence of student stations. Thus, if these recorded responses were to be linked back to the individual students, care would have to be taken to make sure that seats were never changed.

Two cathode-ray terminals were purchased with the original intention that one would be placed in each COMET classroom, and could instantly display the responses of students by station. This idea was abandoned, for it was felt that

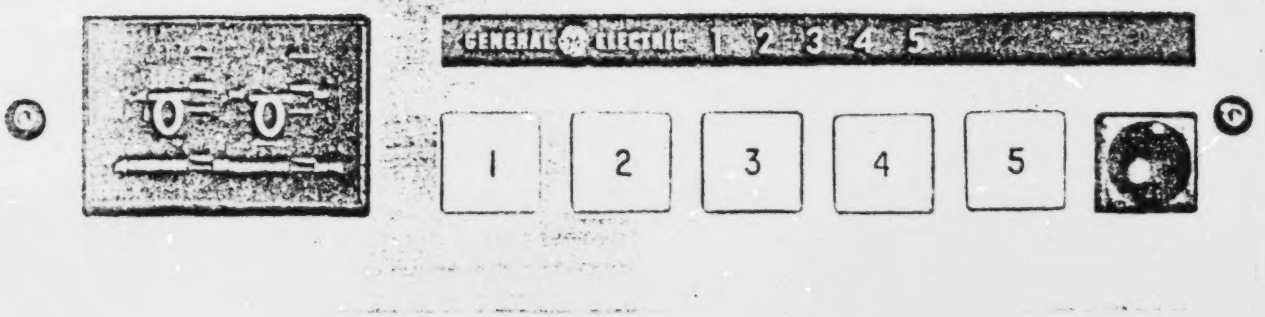


Figure 1

Student Station for Student Response System

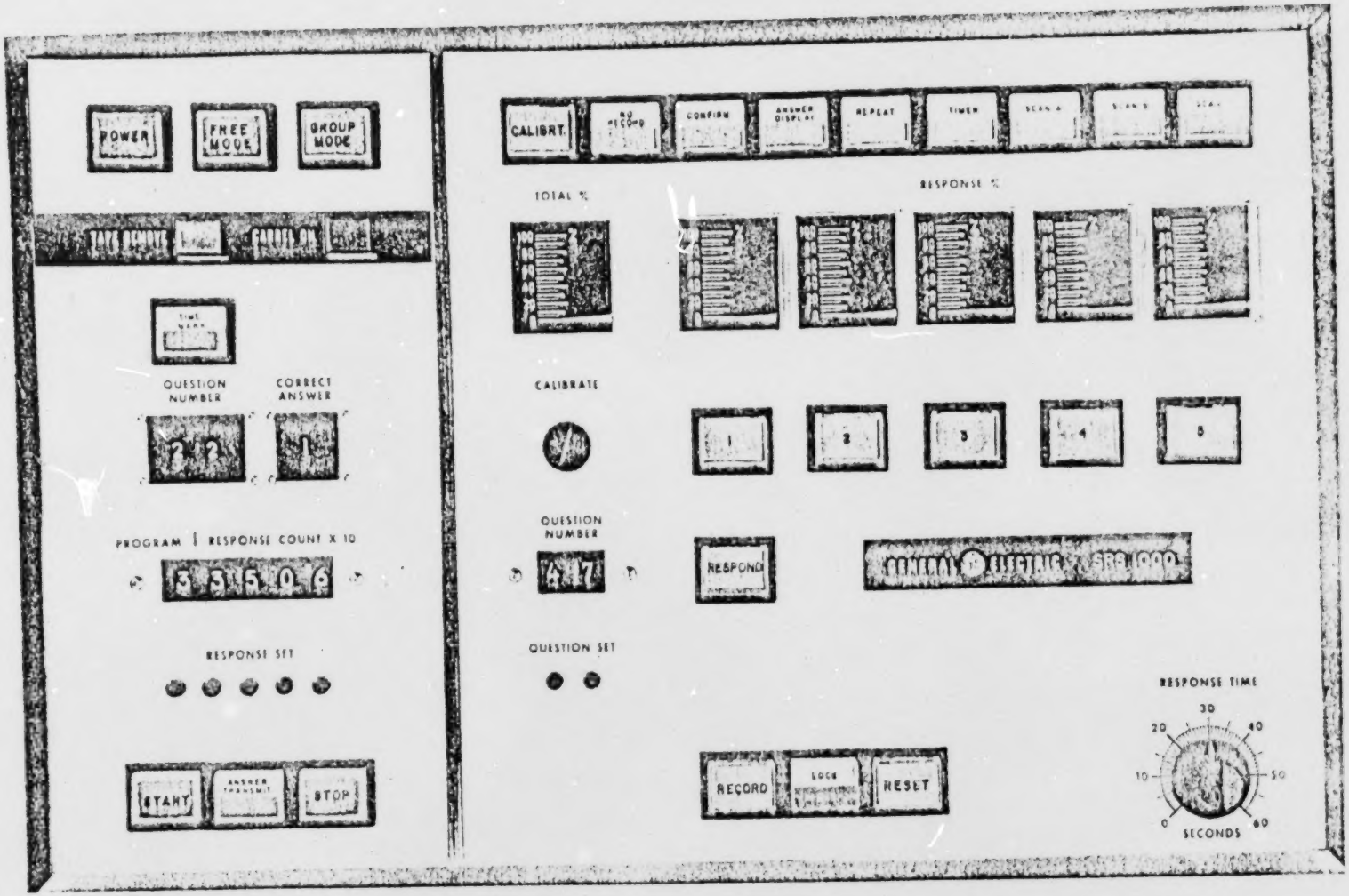


Figure 2

Instructor's Console for Student Response System

the use of the SRS was most valuable when responses could be anonymous. These terminals are new in the computer room where they are being used for non-COMET functions.

Five Audio-Visual Response stations were also purchased to be used by students individually for remedial study, in conjunction with tape and slide lessons which must be developed or purchased separately. A student sits at an equipped carrel and listens to an audio-taped lesson while viewing slides keyed to change at appropriate intervals in the lesson. At various points in the presentation, the student is asked a question and must indicate his multiple choice response on a keyboard at the carrel. The presentation will not continue until the student presses the correct response.

The AVR's can be connected to the mini-computer which will record the students' responses, and the record of these responses may be retrieved at a later time by the instructor. These records would include for each question in the lesson whether the student responded correctly the first time, or will include the choice numbers of every incorrect response that the student may have initially chosen.

One COMET classroom is equipped with a built-in Media Control System (also purchased from Instructional Industries, Inc., model 1000) which provides rear screen projection of single or side-by-side slides, rear screen projection of 16mm sound movies (this may also be used in a side-by-side format with a slide) and videotape. These media may be stopped and started by remote control from the same instructor's console which has the SRS controls. In addition, this room is equipped with an overhead projector, 8mm film projector, and television.

While the other classroom does not have any built-in equipment, there is a portable videotape facility which was purchased for it. Of course, multimedia equipment already available at the college may be used in any classroom.

While the original proposals included the development of software to perform statistical functions on student scores, this was later revised. Instead, hardware was purchased to enable the mini-computer to tap the resources of CUNY's large IBM-370 computer, so that these functions could be handled directly without additional programming.

Software

The software for the COMET program is essentially of two types. The first type, conforming to the more traditional use of the term software, consists of computer programs which enable the computer to perform certain of the desired

functions. Second, CONET requires what the project directors term "educational software"--films, tapes, slides, audiovisual cassettes, etc.--to be used in conjunction with the available media equipment.

The computer programming necessary was done by contracted programmers. The first effort was to provide a format for Student and Teacher Reports of scores. It was originally intended that a Teacher Report would include scores, by student, for all homework assignments, quizzes, independent study modules (if any existed for a student), and recorded classroom SRS responses for a given time period. Currently, Teacher Reports are generated for homework or quizzes only, and each report covers only one homework assignment or one quiz.

The student responses are fed into the computer on mark-sense cards. Each student fills out his own card, on which he must enter his I.D. number and his responses to the various multiple choice questions on the test or assignment. The teacher prepares a master list of student names and their numbers, and the correct response numbers. When all information is fed to the computer, the resulting Teacher Report lists the students by name and I.D. number, and indicates for each student his responses to each item (see Figure 3). A star will appear in the appropriate column to indicate that a student answered that particular question correctly; or the number of the incorrect choice he gave will appear (blank spaces indicate no response). Thus, the instructor can tell not only how many questions were answered correctly, but what the frequent incorrect responses were. It can be seen from the sample Teacher Report in Figure 3, for example, that all students answered item #39 correctly, while almost everyone answered item #28 incorrectly with the most frequent response being choice 2. Many incorrect responses for an item can alert the instructor that a question might have been badly worded, or that many students did not comprehend. In addition to actual responses, the Teacher Report indicates if a student did not respond to a question with a blank space in the appropriate column. For example, the first student listed in the sample report in Figure 3 did not respond to questions 12 through 37. The Teacher Report also gives each student's total percentage correct, as well as the class average.

The Student Report is for an individual student, and contains his multiple choice response to each item, the correct responses for each item, and the percentage he answered correctly (see Figure 4). It was originally planned that if a student's score on a test or assignment fell below a certain mark pre-set by the instructor, his Student Report would contain a "prescription," meaning a

PROGRESS TEST 1 10/14/75

PROF. [redacted] 9308

INSTRUCTOR SUMMARY

				1	2	3	4
ANS. NO.				12345678901234567890123456789012345678901			
CORRECT ANS.				33212415231212111212212232111112221222311			
NAME		ID#	GRADE				
[redacted]		209	30	******3**1*			***
[redacted]		456	88	*******2**********2******111***			
[redacted]		593	88	**********11****2*******11***			
[redacted]		503	90	**********2*2**1****1****			
[redacted]		993	88	**********2*****2111***			
[redacted]		588	98	**********2**********			
[redacted]		654	85	**********1224*******11***			
[redacted]		597	95	**********2*******1****			
[redacted]		432	93	**********2**********2*******1****			
[redacted]		145	90	*****5**********2*2*******1****			
[redacted]		400	98	**********2**********			
[redacted]		547	95	**********2*2**********			
[redacted]		883	98	**********2**********			
[redacted]		682	95	**********2*******1****			
[redacted]		557	93	**********3**********2*******1****			
[redacted]		806	98	**********2**********			
[redacted]		023	95	*1**********2**********			
[redacted]		381	95	**********2*******4****			
[redacted]		852	95	2435122112**213444*431***223*53*4*3331*3			
[redacted]		510	93	**********2*2**********2**********			
[redacted]		638	88	**********11****2*****2*1****			

EXERCISE # 901
CLASS AV.= 87

Figure 3

Sample Teacher Report

PROGRESS TEST 5 10/27/75

[redacted] X #998

INSTRUCTOR PROF. [redacted] SECTION 9309

PERCENTAGE CORRECT 58

	1	2	3	4
ANS NO.	12345678901234567890123456789012345678901			
CORRECT ANS.	21121211142123321141212 2			
YOUR ANS.	****2**231*2344***3***1*			

Figure 4

Sample Student Report

printed suggestion that he do some independent study. So far, this has not been programmed into the Student Reports.

As has been mentioned, up until this point all responses computer-scored have been in multiple choice format. However, programming has proceeded to allow numeric answers written in scientific notation to be scored by the computer. In other words, if the answer to a specific problem was 83, a student would have to enter 8.3×10^{1} in a designated fashion on his mark-sense card.

A program also exists to allow the computer to generate homework and quiz items randomly from a pool of items supplied by instructors. At least two instructors--one from the Electrical Technology Department and one from the Electromechanical Technology Department--are developing item pools for introductory courses.

In terms of "educational software," any films and tapes already in the college's possession could of course be used by an instructor in a COMET classroom. In addition, some money was spent to purchase new materials, mostly in the technologies. Currently, the library consists of 86 16mm films (four of which are non-technical), 32 video cassettes (four are in political science, two are in nursing, the rest are technical), 7 filmstrips (all for English classes), and 86 8mm films (all technical). It should be noted that no modules for the Audio-Visual Response station were either made or purchased.

Staffing

COMET had two project directors--one a professor of Electrical Technology and the other a professor of Electromechanical Technology. When the program was begun, both had some released time in which to plan for how and where equipment would be installed, teach other instructors how to use the equipment, decide which multimedia materials would be purchased, and to actually create some multimedia materials. Also, a half-time secretary was available for ordering and cataloging materials. After the Spring 1975 semester, no further staff time was allotted for these activities.

Although there is no staff now dedicated to supervising COMET's operations, it is estimated by one project director that the computer room operator (an employee of the college) spends an estimated 40% of his time on COMET-related activities. These include seeing to any corrections of computer malfunctions, writing or modifying computer programs, receiving mark-sense cards of homework and quiz responses from instructors and inputting them into the computer, distributing resulting Teacher and Student Reports to instructors, and (with some additional staff help) setting up films or tapes in the COMET classrooms.

Reports from the computer operator indicate that while the time he has available to perform COMET activities is generally adequate, there have been times when equipment failures have been too frequent or too serious for him to handle by himself in a short period of time.

Additional staff time is also spent in creating "educational software," although most of this is done by instructors without compensation: five instructors reported[1] creating multimedia materials such as slides and transparencies, of which two received some released time for their work.

EVALUATION METHOD

The evaluation of COMET was assigned (1) to determine the degree of program implementation, (2) to assess the accuracy, speed, and ease of use of the various components, and (3) to ascertain teacher and student reactions to the program. While it was hoped that some comparison could be made between students in a COMET-equipped class and students in comparable non-COMET classes, no such comparable groups could be found for the study.

The period in which the evaluation was done extended over two semesters: Spring 1975 and Fall 1975. Visits were made by the evaluators periodically during both evaluation semesters. The purposes for these visits were to observe COMET in use in the classroom as well as to talk to the project developers, computer operator, and instructors using the COMET facilities. A total of ten observations were made.

A Teacher Questionnaire was developed for teachers who had used COMET in order to ascertain how much use they made of its various components, and to gain their impressions about COMET's usefulness to them and their students. The first administration was undertaken in May of the Spring semester. A questionnaire (see Appendix A) was mailed to each professor, with the exception of the two project developers, teaching at least one class in a COMET classroom that semester. Of the total eleven which were mailed, six questionnaires were completed and returned.

A Teacher Questionnaire, slightly revised (see Appendix B), was administered again in December to all instructors teaching in COMET classrooms in the Fall semester (this time including the two project developers). Again,

[1] Reports based on responses to the 1974 and 1975 Teacher Questionnaires, see EVALUATION METHOD, below.

the questionnaires were sent by mail: seven of the total of twelve which were mailed were returned. It should also be noted that of these seven respondents, four had responded also to the first mailing in May of the previous semester. Thus, a total of nine different instructors responded either to the May or December questionnaire mailing.

In December 1975, a short Student Questionnaire was administered to students in six classes using the COMET facilities. The questionnaire was designed to elicit student reactions to COMET in terms of its instructional value as well as its ease of use. In two classes, the questionnaires were administered by the IRDOE staff; in the remaining four classes, they were administered by the classroom instructors. A total of 80 students completed the questionnaire.

An attempt was made to record the frequency of use of the SRS and the various multimedia components in the COMET classrooms by having instructors complete a Classroom Checklist for each class period, on which they were to indicate simply which of the equipment was used that hour. A set of Checklists was placed in both COMET rooms in the beginning of September. Although the instructors were told about these forms by the project director and asked to remember to complete them, only two Checklists were completed by the middle of October. Consequently, the use of this instrument was discontinued.

For the Fall semester, the evaluators asked that the computer operator save duplicate copies of all Teacher and Student Reports generated so that a record could be kept of the frequency of results for these reports. Unfortunately, duplicate copies were not kept consistently, so that an accurate count of how many were generated is not possible. Those Reports that were obtained by the educators were used only to help estimate the number of professors who actually made use of the computer grading capability.

USAGE

This section describes the use of COMET in terms of (1) the number of classes and instructors involved, (2) the amount and type of use given the various COMET components, and (3) the extent to which mechanical problems interfered with optimal use.

Number of Departments, Instructors, Class Sections

Classroom schedules for the two COMET classrooms (maintained by the project developers) were used to determine what classes were taught with the aid of COMET

during both evaluation periods. Although every attempt was made to obtain the most up-to-date schedules, changes seemed to occur faster than they were noted. Some figures were amended to conincide with instructors' reports of how many classes they acutally taught in the COMET classrooms.

Table 1 summarizes the number of professors teaching in COMET classrooms during the Spring 1975 and Fall 1975 semesters. In the Spring semester, a total of twelve instructors representing six departments taught classes in the COMET classrooms. Two of these departments were in the Technologies, three were in Developmental Skills (these teach remedial courses) and the remaining department represents the Humanities. In all, twenty-two course sections were taught using COMET facilities.[1]

Table 1

Number of Professors Using COMET Classrooms, By Department, Spring and Fall 1975

Department	Spring 1975	Fall 1975	Total N Different Professors, Spring and Fall 1975[a]
Electromechanical Technology	4	6	6
Electrical Technology	2	2	3
Developmental Math	3	2	3
Developmental Reading	1	1	2
Developmental Writing	1	0	1
Social Sciences	1	1	1
All Departments	12	12	16

[a]This number reflects the number of different professors using COMET, counting only once those who were involved in both semesters. In fact, 8 professors used COMET in both periods, 4 in Spring 1975 only, and 4 in Fall 1975 only.

During the Fall semester, again a total of twelve instructors from five of the same six departments used COMET facilities: only Developmental Writing was no longer represented. The number of sections taught increased to twenty-nine.

Combining the two evaluation semesters, sixteen different instructors were involved in the program: eight used COMET facilities during both periods, four for the Spring only, and four only during the Fall semester. Of the sixteen, nine taught in the Technologies, six in Developmental Skills (mostly math skills), and one in Social Science.

[1]It should be noted that some sections convened in COMET classrooms for each meeting, while others met for only one or two of their course hours in one of these rooms.

It can be seen that most courses taught using COMET were technical or skills oriented. In addition, it should be pointed out that most of these courses involved lower classmen in introductory or developmental classes.

Use of the COMET Components

COMET's components permit four basic types of teaching aid : (1) the Student Response System which polls responses in class; (2) homework and quiz grading, generating, analyzing, and reporting; (3) the use of multimedia in the classroom; and (4) equipment for student self-study. How these aids have been used, and to what extent they are used in practice, will be discussed in this section.

Student Response System. Instructors were asked to indicate on the Teacher Questionnaire approximately how many times they use the SRS in an average class period. Of the nine who completed questionnaires, four indicated using the SRS between 6 and 10 times a period, four indicated between 15 and 20, and on professor simply responded that he used the SRS very infrequently. Many instructors stated that the frequency of use during a class period varied substantially in relation to the type of lesson that day. The amount of use seemed to bear little relationship to the department in which the instructor taught; although it may be important to note that the one instructor who indicated infrequent use also states that his classes are mainly of upperclassmen. As has been mentioned, most classes taught in the COMET classrooms are introductory or developmental classes with mostly lowerclassmen.

The instructors were also asked what they used the SRS for. Most indicated that it was most valuable for drill and practice. In fact, classroom observations indicate that it was often used for this purpose. A professor on several occasions would start a lesson by posing some multiple choice questions requiring understanding of what was taught in previous classes.

The frequent use for drill and practice would support the impression that the SRS is most valuable for those in introductory or developmental classes, since these courses always require mastery of a great deal of basic groundwork. More advanced courses may not have as much use for the SRS for two reasons. First, courses which are more heavily theory oriented or in which more complex topics are covered might not lend themselves as well to the posing of multiple choice questions. Second, advanced courses very frequently have fewer students in them, and it is easier for a teacher to keep track of whether each student understands the material during a class period.

The instructors were asked to estimate what proportion of the class does not respond to a question posed via SRS. Since the equipment is calibrated in terms of the entire class, this information is readily apparent. Five instructors report that less than 5% fail to respond; three stated that 10% or less fail to respond, while one indicated that anywhere from 60% to 80% do not respond.[1]

When asked to characterize non-responders, most teachers indicated that they were the "slower students," or the "less motivated" or "students needing personal tutorial help."

Several instructors indicated they used SRS to check their teaching effectiveness; in other words, to determine whether most or all student comprehended what was being taught. One instructor indicated that he found SRS useful to poll opinions. Another said he posed questions through SRS to keep students alert. While some instructors indicated the value of SRS for testing, one stated that he found this to be one of its least valuable functions.

It has been mentioned that SRS may be used with several variations: answers may be computer-recorded by student station or anonymous; the correct response number may or may not be keyed to flash. In terms of keying in the correct response, observations indicate that sometimes this is done, and sometimes not.

The computer link for the purpose of recording student responses was never used except on a trial basis to guarantee that the computer link was operating. According to a project developer, the SRS is always used for immediate and anonymous feedback in the classroom. That is to say, the SRS is used to determine proportions of students answering each way, but not to discover and record what each individual student's response was.

In fact, the project developers, in consultation with other professors, decided that the SRS was most useful when students could remain anonymous. This way, they would be more willing to indicate their honest answers to questions posed. For this reason, the cathode ray terminals which were originally going to be in the classrooms to instantly display each individual student's responses to questions answered through the SRS, were never installed.

It should be emphasized, then, that the SRS capabilities requiring the use of the mini-computer were found to be unnecessary or unuseful. Thus, in terms

[1] It should be noted that this one report of high incidence of no response comes from the same instructor who reports using the SRS very seldom.

of the COMET project, SRS has developed into a non-computerized classroom aid.

In summary, observation and available responses to the Teacher Questionnaire indicate that SRS is most often used from 6-10 or 15-20 questions per class period; mainly for drill or for testing teaching effectiveness and student progress; and operates without the aid of the computer link, thus used only to poll students' anonymous responses.

Grading by Computer. The COMET system has the capability to (1) score multiple choice responses, (2) score numeric responses entered in scientific notation, and (3) generate printed reports of homework or quiz grades for each individual student (Student Report) and for the classroom teacher (Teacher Report).

The project developers expected minimal use of these capabilities in the Spring 1975 semester since the necessary procedures and programming were not yet completed. For this reason, no attempt was made to evaluate COMET's grading functions until the Fall 1975 semester.

By the Fall of 1975, decisions had been made regarding procedures for obtaining Teacher and Student Reports, as well as the content and format of these reports. In terms of procedures, it was decided that the Computer Room operator would receive from the classroom instructor the set of completed student mark-sense cards (each card contains one students' responses to all questions) for a given homework assignment or quiz. The operator would then input the data to the computer and obtain the Teacher and Student Reports. The instructor would then pick up this output, keeping the Teacher Report and distributing the individual Student Reports to his class members.

In terms of the content of the reports, it was decided that each quiz or homework assignment would be submitted for computer grading separately, so that a Teacher Report would include only one set of student scores and a Student Report would involve only one score. Thus, the computer would not be used to store all student responses for retrieval after a given time period (a week was once being considered), but would simply generate one set of scores at the time that those responses were entered.

During the Fall semester, the evaluators requested duplicate copies of all Teacher Reports generated by the computer. From the professors' names indicated on these reports and from responses to the Teacher Questionnaire, it was determined that four of the twelve professors using the COMET facilities used the computer for homework and quiz grading in the Fall semester. Of these four, only two seemed to use this facility fairly frequently: one professor estimates

having two assignments or quizzes computer-scored per class section per week; the other estimates one such use. From information collected, the remaining two professors had approximately three quizzes graded each for the entire semester.

The capability of having the computer score numeric responses entered in scientific notation was not functional (in terms of having the necessary computer programming ready to accept such responses) until the middle of the Fall semester. By the semester's end, no instructors had used this function yet, although three instructors indicated they intend to.

The instructors who did use the grading capability were asked how long it usually takes from the time a Teacher Report of the results of a quiz or homework assignment is requested until it is obtained. Two responded: one indicated that the results are obtained within a day; the other stated within three days. The disparity in these two responses is explained by the differences in how these two professors submit the students' complete mark-sense cards. One professor collects them from the students himself and submits them in a set to the computer operator, and is able to receive his Reports within a day. The other professor instructs his students to submit their mark-sense cards individually to the computer operator, who must wait for all or most students to comply before running the set through the computer. Thus, the real answer seems to be that reports of scores can be obtained within a day, provided students have all handed in their responses.

Item Score Analysis. To the knowledge of the evaluators, professors have not used the computer to perform statistical analyses of item scores with the use of the link-up to the large CUNY computer. This seems natural since the number of students in these classes is small, and the amount of data required about tests is most likely unsophisticated. However, the Technology Learning Center, which has many students working on similar units at different times, does have student responses recorded by the computer for future item analysis purposes.

Item Generating by Computer. The COMET potential to generate homework or quizzes by computer--i.e., to randomly select questions from a pool of items created by the instructor--had still not been realized by the end of the evaluation period because no item pools existed as yet. It is expected that item pools for some topic(s) in Electromechanical Technology will be ready by Spring 1976.

To summarize, the scoring and reporting functions of COMET are being used by few professors at this time; no question generating is being done, although item pools for this purpose are being developed; and the statistical analyses possible, while rarely used by classroom teachers, is being used by the Technology Learning Center.

Use of Multimedia. From information gathered in the first Teacher Questionnaire, it would appear that the multimedia equipment was used fairly infrequently during the Spring semester. The only equipment used by more than one of the instructors who responded were the overhead projector and the slide projector. It should be recalled, however, that much of the educational software which was created or purchased to be used with the media equipment was not available until the Fall semester.

Table 2 summarizes the responses of six instructors[1] completing the second Teacher Questionnaire to a question in which they were asked to indicate to what extent they made use of the various media equipment during the Fall semester. While no piece of equipment was used frequently by a majority of respondents, it can be seen that all multimedia components were used to some extent. The film equipment was used frequently by half the professors, while the overhead projector was used at least somewhat by each professor.

Table 2

Proportion of Teacher Questionnaire Respondents Using Multimedia Equipment, Fall 1975

	Using Frequently	Using Moderately	Using Infrequently	Not Using
Overhead Projector	40	0	60	0
Television	33	0	33	33
Tape Recorder	25	0	0	75
16mm, 8mm Projectors	50	17	17	17
Slide Projector	0	33	50	17

The instructors completing the Fall questionnaire were also asked to rate the usefulness of the various multimedia facilities--regardless of whether or not they had used them--as being very useful, useful, somewhat useful, or not

[1] This question is summarized on the basis of the answers of 6 of the 7 respondents, since one respondent only conducted classes in the COMET classroom not equipped with media.

very useful. Scores were calculated for each component, with 4 being the highest score for usefulness and 1 the lowest. All scores ranged between 3.2 (tape recorder) and 3.7 (overhead projector). It can be seen that among the questionnaire respondents, all the media facilities are seen as quite useful regardless of the fact that they have not yet received heavy use.

It appears that some instructors at least would use the media equipment more if a greater amount of educational software relevant to their courses was available at the college. The one professor of Social Sciences using COMET plus one professor of Electromechanical Technology indicated that insufficient materials were currently available. Although one professor indicated he may generate some films for his course, the other stated that he had too little time to create media resources. Other professors indicated that, by and large, there were sufficient resources available to them, although they would use the equipment more if additional materials were available.

The instructors were asked whether they used media in conjunction with SRS. Four answered that they did: some stop films or slide presentations at various points to pose key questions through SRS; at least one instructor has put multiple choice drill questions on slides.

Student Self-Study. It has been mentioned that the Audio-Visual Response (AVR) stations purchased in conjunction with COMET are currently in the Technology Learning Center, where students may come to work individually on topics they are having difficulty with. The Center is equipped with most paper-and-pencil self-study modules which a student can use on his own either as part of a developmental skills course, on the prescription of an instructor who decides the student needs remedial work in some area, or on the student's own initiative.

Thus far, it appears that the AVR's have been used infrequently if at all. On two site visits to the Technology Learning Center in November 1975, the AVR's were not set up, nor did it seem there were plans to install them. The reason for this as it was related to the evaluator was that few tape-and-slide modules were available to be used in conjunction with the AVR's and they were too difficult to create. One project director indicated that, in retrospect, the AVR's were probably a poor investment because the time and effort required for this use (both to set up and to create modules) were too great. In his opinion, most students could learn just as well using less elaborate materials--such as the paper-pencil materials already available at the Technology Learning Center.

Prescriptions for Remedial Study. It will be recalled that one of COMET's functions was to be the prescribing of remedial activities or a self-study basis to students needing additional work. This function has also been undeveloped as yet. It would be possible with very little additional programming to do what the program developers intended--to include messages on computer-generated Student Reports if the student score fell below a certain score to indicate that the student should do some independent study on the topic. However, the instruction can be given verbally by the instructor just as easily by his announcing to the class what an acceptable score would be. Because of this, the project directors have essentially ignored this original idea.

For COMET to be made truly prescriptive, the computer would have to be used to do such things as list the available self-study modules that an individual student might benefit from given his performance on certain items. This, however, would take considerably more programming.

Summary. The data presented describing the use of the various components demonstrates that the Student Response System was the most consistently used COMET capability. The multimedia equipment was used to varying degrees by all instructors, and level of use seemed to depend primarily on the availability of appropriate "educational software." Two hardware components, the AVR's and the cathode ray tubes, have not--and probably will not--be used in the manner originally intended, because these intentions proved impractical.

It is interesting to note that none of the computer-related functions have received much use as yet. The SRS and AVR's will probably never be used to record responses through the computer links; question-generating by computer, statistical item analysis, and prescribing remedial work are all functions which remain undeveloped thus far; and grading by computer has been used by only four out of twelve professors in the Fall semester.

Mechanical Problems Related to Usage

Any program with a substantial hardware component is dependent upon the adequate operation of the hardware for success. Equipment should be relatively easy to maintain in good working order, and those components used by teachers and students should be simple enough to operate.

Feedback from the Teacher and Student Questionnaires indicates that no teacher or student operated equipment was difficult to learn to use. All but one teacher stated that they felt comfortable with the operation of the SRS within two class periods; the remaining instructor indicated that this took

several weeks. When students were asked how long it took for them to be comfortable using SRS, the mean response was 1.4 class periods.

Teachers also reported little difficulty with operating the multimedia equipment. The only problem which was identified by one instructor was that security consideration, particularly in relation to the 16 millimeter equipment, made for more difficulties for users.

As few students have used the Audio-Visual Response stations, the ease of use has not been investigated.

Mechanical problems were encountered during the evaluation periods--most minor, one major. In terms of the media equipment, it was noted by one instructor that occasionally there is malfunctioning of the relays which permit the video system to be operated by remote control, so that the equipment must be manually operated. No other malfunctions of media equipment were noted.

It was reported by two instructors that there is an occasional delay in obtaining computer-scored Teacher and Student Reports of quizzes and homeworks because of problems with the computer. These delays, however, were characterized as "very rare."

Problems with the SRS equipment were of two types. First, it was noted that from time to time a student station will fail to operate--a student's response will not be "read" by the computer. Apparently, this is sometimes due to vandalism. The wires which hook up the stations have occasionally been found cut. Judging from the teachers' responses, these SRS difficulties have not been found to be troublesome.

One serious problem did occur which caused the SRS to be inoperable for almost the entire Fall semester in one of the two COMET classrooms. In this classroom, the SRS equipment was installed (by the company from where it was purchased) on desks which were temporary (the permanent desks acquired for this room had not yet been delivered). When the new desks arrived, during the summer of 1975, SRS had to be dismantled and re-installed on the new furniture. Since purchase of the SRS only entitled the college to original installation by the manufacturer, this reinstallation was done by the project staff who encountered some difficulties. According to the computer room operator, these difficulties were not straightened out until almost the end of the Fall semester because (1) staff had very little time to correct the problems, and (2) by this time the warranty on the SRS had expired, and no money existed to call for repairing.

Several conclusions may be drawn with respect to the COMET hardware. The

first is that given "normal" operating conditions, no equipment presented serious problems in terms of difficulty of use or frequency of breakdowns. The only major difficulty was in coordinating the purchase and installation. Whereas there might be a lesson in this, it should be noted that it is often difficult, if not impossible, given funding and delivery dates, to mount a hardware system in optimal sequence.

PARTICIPANTS' REACTIONS

This section will discuss student and teacher reactions to COMET in terms of its value for instruction purposes, and will include their suggestions for program improvement. The data was gathered from the Teacher Questionnaire, Student Questionnaire, and site visits.

Teacher Reactions

By and large, the teachers responding to the questionnaire were very enthusiastic about the COMET project. While it is possible that those teachers who did not respond to the questionnaires (7 out of 16) did so out of lack of interest, it should be noted in fairness that the questionnaires were seven and eight pages each. Thus, it is equally possible that their failure to respond was due in part to lack of time.

Reaction to the SRS was overwhelmingly positive. All but one instructor felt that it had been a valuable tool for them. Two indicated that it "assured comprehension" on the part of students; several indicated that it was useful for evaluating their own lessons in terms of their pace and teaching strategy. One professor noted that SRS presented a "challenge to the students," and further that it was valuable to have a means for students to respond anonymously with "no public shame."

Negative comments came from one professor who stated that, with a small class, direct response was easier. He also felt that particularly with sections of upperclassmen, there is "no need for machinery." In marked contrast to others, this professor noted a decrease in student enthusiasm about the SRS as time went by, a condition which he attributed to "the novelty wears off."

Suggestions for how the tool could be improved primarily involved the ability of the SRS to handle more than multiple choice responses. Several instructors found restriction to this format limiting. Unfortunately, this would undoubtedly require a much more elaborate system.

Comments about the homework and quiz grading capabilities were fewer since so many instructors had not made use of these functions. When asked whether computer grading would be a useful function for them regardless of whether they had used the service, the professors were divided in their opinions. Among the four who had used the computer for scoring, two professors found it a useful tool, one did not, and one never responded to the questionnaire. The favorable comments were that it made the checking of item difficulty very easy and provided immediate feedback.

On the negative side, it was noted that the computer will not give partial credit for a question, whereas a teacher may want to give it. Also, it was indicated that the necessity of having questions in multiple choice format made computer grading not always useful. It should be noted that with the availability now of scientific notation as an answer format, the usefulness of the scoring capability may improve at least for teachers of math-oriented courses. A third negative comment voiced by one professor was that it takes too much time to set up the procedures for having computer scoring--questions must be in proper format, students must transfer responses to mark-sense cards, all must be submitted with proper student identification, etc.

It is difficult to say anything conclusive about the value of COMET's computer grading when so few have taken advantage of it. It is possible that more time is needed for the faculty to begin to use all the available resources, particularly this resource. Since only certain answer formats will ever be accepted for computer scoring, teachers either have to change homeworks and quizzes, or learn to use COMET's facilities for only selected exams and assignments. Either option takes planning time on the part of instructors.

It has been mentioned that instructors rated most of the multimedia equipment as being very useful. The only reservations voiced by some instructors involved the insufficiency of films, tapes, transparencies, etc. which were relevant to their courses. The acquisition of more of such "educational software" requires either an instructor's time (which is often unavailable) or funds for additional purchases.

In terms of student self-study, it has been seen that no modules currently exist at the college to be used with the Audio-Visual Response stations, and that their development seems to be thought of as being an unworthwhile use of time and/or money. As for the value of non-audio-visual self-study modules, the four instructors who are known to have assigned modules available at the Technology

Learning Center have found them to be valuable for their students. While some indicated their usefulness for all students, others mentioned that the modules worked best with students who were motivated enough to do the extra work, and with students without bad reading deficiencies. Presumably, modules which would be created for the Audio-Visual Response stations would not require so much reading ability, but as has been discussed, these modules have so far proved too difficult to create.

To sum up, most professors who were involved in the COMET project found the SRS a very valuable tool for pacing and modifying their lessons and for determining student comprehension. The other main COMET capabilities were found to be of value among those few instructors who made use of them, but received relatively little use, either because the functions themselves were found to be useful only to some professors, or (more often) because insufficient materials were developed to be used in conjunction with the equipment purchased.

Student Reactions

The Student Questionnaire asked students questions mostly relating to the Student Response System in order to determine how good a classroom aid they felt it to be. These results, along with some of their comments will be discussed in this section.

The questionnaire was administered to a total of eighty[1] students in six classes using the SRS. These classes were taught by five different instructors who taught in four different departments--Social Sciences, Developmental Skills, Electrical Technology, and Electromechanical Technology.

When asked whether they prefer to answer questions anonymously through SRS rather than raising their hands in class, 72% of those students responding said "yes." A majority of students also felt that the use of SRS makes them more sure of questions that they think they know the answer to: 66% answered that this was true.

On the whole, SRS did not seem to make a difference in students' willingness to ask questions of the professor in class--73% of the students responding to this question indicated that their degree of question-asking had not changed. Of those who said it had, most indicated that they now ask more questions.

The results of a question which asked whether students preferred SRS-equipped

[1]Results summarized in this report are only based on 79 respondents, as one student indicated that he had never used the SRS (probably a midunderstanding, as all his classmates had).

or non-SRS classrooms were fairly neutral. Half the students responding to this questions preferred SRS classrooms, 40% said it made no difference and about 10% preferred non-SRS rooms.

A sample of students' neutral or negative comments follows:

- "In some cases the SRS makes it easier for us to learn, but in classes where we might need extra explanation on a subject, it would be better without SRS."
- "You can feel more open in your class without SRS...."
- "SRS costs too much for the college."
- "A machine cannot relate to specific problems students have, a HUMAN BEING can!"
- "Either way [with or without SRS] you still learn something."

Comments in favor of SRS included the following:

- "Classes seem to move along better, and you know what area more work is needed in."
- "The instructor can find out what percent of the class understands the work without questioning everybody."
- "One knows whether he is right or wrong immediately."
- "It makes the class more interesting and more can be taught."
- "More students will give an answer through SRS, because of the fact the others will not [know] if you give an incorrect answer."
- "I feel that the SRS gives the student the ability to know for himself if he is right or wrong. Embarrassment might stop him otherwise."

It should be noted that the most frequent comments characterized SRS classrooms as being "more relaxed," and making answering questions "less embarrassing."

In summary, about half the students questioned preferred SRS-equipped classrooms, and a majority of students preferred answering questions using SRS rather than raising their hand in class.

SUMMARY AND CONCLUSIONS

The Computer-Managed Education Technology Program was conceived to improve group instruction by offering certain technological aids in the classroom. There is no question that most professors have found those COMET components which they have used to any great extent useful tools. However, a true evaluation of the program would have to come at a point when COMET is used more than it is currently.

The Student Response System was found to be a valuable aid by almost every teacher and by many students using the COMET facilities. The multimedia equipment

was also found to be very useful by those professors for whom sufficient "educational software" was available.

Many of the other COMET components, however, have been used infrequently or not at all. In the case of two of the hardware components, it may be concluded that they have proved impractical for the purposes intended: the Audio-Visual Response Stations appear more difficult to create modules for than they are deemed worthwhile as teaching tools; and it was decided that the cathode ray terminals for displaying SRS results did not perform a teaching function valuable enough to warrant installation.

Ironically, all of the computerized capabilities of this Computer-Managed Education Technology Program--homework and quiz grading, item generating, statistical analysis of student scores, prescribing remedial work, recording SRS responses, recording AVR responses--have thus far received minimal use at best.

One of the reasons for the low use of so many components appears to be that some functions are more applicable to some courses than to others--e.g., homework grading by computer is only suitable for those courses which lend themselves to multiple choice or numeric-answer tests or assignments.

Another, and probably the most important reason for the generally low use is that much more than working hardware is needed for these functions to be employed. Item pools must be generated before the computer can generate tests; assignments must be made to fit into multiple choice format and students must be instructed on properly filling out mark-sense cards before the computer can be used for grading; and tapes, slides, films, etc. must be purchased or created to be used with media equipment.

All of these kinds of activities must take place if the technological aids are going to be optimally used. When time and money exist for persons to do the necessary development and to purchase abundant "educational software," program implementation becomes a faster process. For COMET, development will be slow and will depend upon teachers finding their own time to do such things as create materials and possibly alter testing and teaching strategies.

In the future, if COMET's level of use continues to increase, certain new problems will have to be addressed, such as the availability of adequate staff for maintaining the equipment in proper working order. If the level of use does not increase substantially, the question of cost-effectiveness will probably have to be addressed by those institutions planning similar programs--

particularly the feasibility of purchasing a mini-computer, unless it is to be used for other types of activities as well.

In conclusion, what currently exists as Computer-Managed Education Technology is still more potential than finished product.

APPENDIX A

COMET - Teacher Questionnaire, May 1975

INSTITUTE FOR RESEARCH AND DEVELOPMENT IN OCCUPATIONAL EDUCATION

COMET-Teacher Questionnaire, May 1975

GENERAL INFORMATION

1. In what department do you teach?_____

2. How many sections do you teach in all?_____

3. How many sections do you teach in the COMET classrooms?_____

4. For how many semesters, including the present one, have you used the COMET equipment with at least one section?_____

COMET COMPONENTS

The COMET system at NYCC consists of various components, and we would appreciate knowing about your experiences with each. The following groups of questions will ask about:

A. The Student Response System (SRS)
B. Computer Grading and Generating of Homework and Quizzes
C. Teacher and Student Reports
D. Multi-Media Equipment
E. Student Self-Study Modules

A. Student Response System (SRS)

1. How long did it take you to learn to operate the SRS comfortably?

_____

2. To the best of your knowledge, is the SRS always accurate when recording student responses?

____Yes

____No If no, what kind of inaccuracies have you noted?_____

_____

3. Does the SRS equipment ever break down?

Never an equipment Malfunctions	Infrequent Malfunctions	Frequent Malfunctions	Very Frequent Malfunctions

4. For approximately how many questions per class period do you use SRS?

_____

5. Do you find you use the SRS more or less now than when you first started using the system? ____More ____Less ____The same amount
To what do you attribute any change?_____

_____

6. What kinds of revisions have you made in your teaching materials or methods which are attributable to SRS?

7. For what kinds of classroom activities do you find the SRS most helpful? (e.g. stimulating discussion, polling opinions, testing, teaching effectiveness, etc.)

For what activities do you find SRS least helpful?

8. Do you find the SRS more useful for some courses, or some types of students, than others? ____No ____Yes; if yes, which?

9. About what percentage of students don't respond on the SRS when you ask a question?_____

10. Does the percentage in question 9 vary as the semester progresses?

____No ____Yes; if yes how?_____

11. How would you characterize "non-responders" in terms of such things as motivation, aptitude, etc?

12. In general, do you feel that the SRS has been a valuable tool for you? Please explain why.

B. Computer Grading and Generating of Homework and Quizzes

1. Approximately how many homework assignments and quizzes per section per week do you have computer scored?_____

   Approximately how many assignments and quizzes per section per week do you hand grade?_____

2. Do you find that as a result of COMET, the number and type of homework assignments or quizzes you give have changed?

   ____No

   ____Yes; if yes, please describe the change._____

   _____

   _____

3. Have you observed the computer grading to be accurate?

Always accurate	Usually accurate	Sometimes accurate	Rarely accurate

   What kinds of inaccuracies, if any, have you found?

   _____

4. How long from the time a homework assignment is handed in by students does it take to have the results returned to you from the computer?

   _____

   Is this too long a time period? ____Yes ____No

5. Do you find the grading capabilities of COMET useful for the kinds of quizzes and assignments you give? ___Yes ___No ___Not sure
   Please explain.

6. Comet has the capability of generating homework or quizzes from a list of items obtained or developed by an instructor. Have you ever used the computer to <u>generate</u> homeworks or quizzes?

   ____Yes; if yes, who developed the items? On free time?_____

   _____

   ____No; if not, are there generated items appropriate for your courses? ____Yes ____No ____Not sure

Do you think generating homework is (would be) a valuable function for your needs?

____Yes; if yes, do you think you will create items for a computer pool?_____

____No; if not, why?_____

C. Teacher and Student Reports

1. Do you request teacher reports after every class period?

____Yes

____No; if not, how often do you request them?

_____

2. Are student reports distributed after each class?

_____Yes

_____No; If no, how often are they distributed?

_____

3. Usually how long does it take from the time you request a teacher report to obtain it?_____

Is this too much time? ____Yes ____No

4. Do you find the procedures for obtaining teacher and student reports efficient?

_____Yes

_____No; if not, how would you revise the procedures?_____

_____

5. Do you use the teacher reports more or less now than when you were first able to obtain them? ____More ____Less ____About the same.

Please explain any change_____

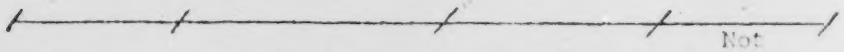
6. Are teacher and student reports ever unavailable due to mechanical malfunctions?

_____No

_____Yes; If yes, how frequent are these malfunctions?

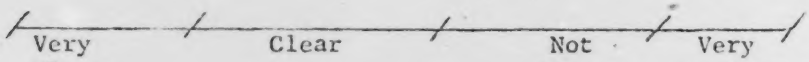
_____

7. Do you find the information on the reports accurate?



Always accurate	Almost always accurate	Usually accurate	Not Usually accurate

8. How clear do you find the formats of the teacher and student reports: are they easy to read and interpret?



Very Clear	Clear	Not Clear	Very Unclear

What specific changes would you make in the format?_____

_____

9. For what activities do you find the teacher and student reports most helpful? (e.g. grading, checking a student's weekly progress, etc.)

For what activities do you find the reports <u>least</u> helpful?

10. What additional information would you like to see included in the reports?

11. Overall, do you find the teacher & student reports are (or can be with the amendments you have proposed) a useful tool for you and/or for your students? ____Yes ____No

Please explain why.

D. Multimedia Equipment

1. COMET makes available a variety of multi-media equipment. Indicate to what extent you have used each of the following:

	Have Used Frequently	Have Used Moderately	Have Used Infrequently	Have Not Used Yet
Overhead Projector	_____	_____	_____	_____
Television	_____	_____	_____	_____
Tape Recorder	_____	_____	_____	_____
16mm, 8mm Projector	_____	_____	_____	_____
Slide Projector	_____	_____	_____	_____

2. Please indicate how useful you think each of the following are for the courses you teach regardless of whether or not you have used them yet:

	Very Useful	Useful	Somewhat Useful	Not Very Useful
Overhead Projector	_____	_____	_____	_____
Television	_____	_____	_____	_____
Tape Recorder	_____	_____	_____	_____
16mm, 8mm Projector	_____	_____	_____	_____
Slide Projector	_____	_____	_____	_____

3. Have you used multi-media equipment in conjunction with SRS?
____No ____Yes; if yes, describe.

4. Do you find all the equipment easy to use?

____Yes

____No; if no, what specifically gives the most trouble?

_____

5. Have you experienced many mechanical problems with the equipment?

____No

____Yes; If yes, of what type?_____

_____

6. For your needs, is there sufficient "educational software" (e.g. films, tapes, transparancies, etc.) available at NYCC to be used with the multi-media equipment? ____Yes ____No ____Not sure

7. Have you generated any educational software of this type yourself?

____No; if no, what (if anything) would you like to generate?

_____

____Yes; if yes, what? Were you compensated for your time?

_____

_____

8. Would you make more use of the multi-media equipment if additional appropriate educational software were made available?

____Yes ____No ____Not sure

E. Student Self-Study Modules

1. Do you frequently prescribe self-study modules to students?

_____Never _____Sometimes _____Frequently

2. On what basis do you assign self-study modules?

3. Do you find, from your experience, that the self-study module is valuable for students needing additional study?

_____No

_____Not sure

_____Yes, for all students

_____Yes, for some students (specify)_____

_____

4. Is there a sufficient number of self-study modules available at NYCC for the curricula you teach? ____Yes ____No ____Not sure

5. Would you have students make more use of the self-study stations of additional appropriate modules were available for your curriculum?

____Yes ____No

6. Have you created such modules for your students?

___Yes; if yes, approximately how many? Did you receive some compensation? _____

_____

___No; if no, do you intend to? With or without some compensation?

_____

_____

GENERAL COMMENTS

Please use this space to give us any overall impressions of the COMET System at NYCC. Please include student reactions you have noted, as well as any suggestions you might have for improving on COMET's capabilities.

APPENDIX B

COMET - Teacher Questionnaire, December 1975

CASE INSTITUTE FOR RESEARCH AND DEVELOPMENT IN OCCUPATIONAL EDUCATION

COMET-Teacher Questionnaire, December 1975

GENERAL INFORMATION

1. In what department do you teach?_____

2. How many sections do you teach in all this semester?_____

3. How many sections this semester do you teach in the COMET classrooms?

   _____

   Approximately how many students are in each section?_____

4. For how many semesters, including the present one, have you used the COMET equipment with at least one section?_____

COMET COMPONENTS

The COMET system at NYCCC consists of various components, and we would appreciate knowing about your experience with each. The following groups of questions will ask about:

A. The Student Response System (SRS)
B. Computer Grading and Generating of Homework and Quizzes
C. Teacher and Student Reports
D. Multi-Media Equipment
E. Student Self-Study Modules

A. Student Response System (SRS)

1. How long did it take you to learn to operate the SRS comfortably?

   _____

2. To the best of your knowledge, is the SRS always accurate when recording student responses?

   _____Yes

   _____No; if no, what kind of inaccuracies have you noted?_____

   _____

3. Does the SRS equipment ever break down?

Never an equipment malfunction	Infrequent malfunctions	Frequent malfunctions	Very frequent malfunctions

4. For approximately how many questions per class period do you use SRS?

   _____

5. Do you find you use the SRS more or less now than when you first started using the system? _____More _____Less _____The same amount

   To what do you attribute any change?_____

   _____

6. What kinds of revisions have you made in your teaching materials or methods which are attributable to SRS?

7. For what kinds of classroom activities do you find the SRS most helpful? (e.g., stimulating discussions, polling opinions, testing, teaching effectiveness, etc.)

   For what activities do you find SRS least helpful?

8. Do you find the SRS more useful for some courses, or some types of students, than others? _____No _____Yes; if yes, which?

9. About what percentage of students don't respond on the SRS when you ask a question? _____

10. Does the percentage in question 9 vary as the semester progresses?

    _____No _____Yes; if yes, how?_____

11. How would you characterize "non-responders" in terms of such things as motivation, aptitude, etc?

12. In general, do you feel that the SRS has been a valuable tool for you? Please explain why.

B. Computer Grading and Generating of Homework and Quizzes

1. Approximately how many homework assignments and quizzes per section per week do you have computer scored?_____

   Approximately how many assignments and quizzes per section per week do you hand grade?_____

2. Do you find that as a result of COMET, the number of homework assignments or quizzes you give has changed?
   _____No
   _____Yes, increased
   _____Yes, decreased

3. Do you find that as a result of COMET, the type of homework assignments and quizzes you give have changed?
   _____No _____Yes; if yes, please describe the change_____
   _____
   _____

4. The computer now has the capability of scoring responses entered in scientific notation. Have you given computer-scored quizzes of assignments where answers were in this format?
   _____No; if no, do you ever intend to?_____
   _____Yes, infrequently
   _____Yes, frequently

5. If you did try to have students enter responses in scientific notation, did you find that students had difficulty?
   _____No
   _____Yes; if yes, do you think this was due to:
   _____students' insufficient ease with scientific notation
   _____confusing format of mark-sense cards
   _____others, please specify:_____

6. Do you find the grading capabilities of COMET useful for the kinds of quizzes and assignments you give? _____Yes _____No _____Not sure
   Please explain.

7. COMET has the capability of generating homework or quizzes from a list of items obtained or developed by an instructor. Have you ever used the computer to <u>generate</u> homework or quizzes?
   _____Yes; if yes, who developed the items? On free time?_____
   _____
   _____No; if not, are there generated items appropriate for your courses?
   _____Yes _____No _____Not sure

8. Do you think generating homework is (would be) a valuable function for your needs?

_____Yes; if yes, do you think you will create items for a computer pool?_____

_____No; if not, why?_____

C. Teacher and Student Reports

1. The Teacher and Student reports may contain scores for homework, quizzes, and/or classwork (recorded SRS responses). Which scores have you ever requested in report form? Please check one or more.

_____homework _____quizzes _____classwork _____none

2. Usually how long does it take from the time you request a teacher report to obtain it?_____

Is this too much time? _____Yes _____No

3. Do you find the procedures for obtaining teacher and student reports efficient?

_____Yes

_____No; if not, how would you revise the procedures?_____

_____

4. Are teacher and student reports ever unavailable due to mechanical malfunctions?

_____No

_____Yes; if yes, how frequent are these malfunctions?_____

_____

5. Do you find the information on the reports accurate?

Always accurate	Almost always accurate	Usually accurate	Not usually accurate

6. How clear do you find the formats of the teacher and student reports: are they easy to read and interpret?

Very clear	Clear	Not clear	Very unclear

What specific changes would you make in the format?_____

_____

7. For what activities do you find the teacher and student reports most helpful? (e.g., grading, checking a student's weekly progress, record-keeping, etc.)

For what activities do you find the reports <u>least</u> helpful?

8. Do you use the teacher reports more or less now than when you were first able to obtain them? _____More _____Less _____About the same

   Please explain any change_____

9. What additional information would you like to see included in the reports?

10. Overall, do you find the teacher and student reports are (or can be with the amendments you have proposed) a useful tool for you and/or for your students? _____Yes _____No

    Please explain why.

D. Multimedia Equipment

1. COMET makes available a variety of multi-media equipment. Indicate to what extent you have used each of the following:

	Have Used Frequently	Have Used Moderately	Have Used Infrequently	Have Not Used Yet
Overhead Projector	_____	_____	_____	_____
Television	_____	_____	_____	_____
Tape Recorder	_____	_____	_____	_____
16mm, 8mm Projector	_____	_____	_____	_____
Slide Projector	_____	_____	_____	_____

2. Please indicate how useful you think each of the following are for the courses you teach regardless of whether or not you have used them yet:

	Very Useful	Useful	Somewhat Useful	Not Very Useful
Overhead Projector	_____	_____	_____	_____
Television	_____	_____	_____	_____
Tape Recorder	_____	_____	_____	_____
16mm, 8mm Projector	_____	_____	_____	_____
Slide Projector	_____	_____	_____	_____

3. Have you used multi-media equipment in conjunction with SRS?

   _____No _____Yes; if yes, describe.

4. Do you find all the equipment easy to use?

_____Yes _____No; if not, what specifically gives the most trouble?

_____

5. Have you experienced many mechanical problems with the equipment?

_____No _____Yes; if yes, of what type?_____

_____

6. For your needs, is there sufficient "educational software" (e.g., films, tapes, transparencies, etc.) available at NYCCC to be used with the multi-media equipment? _____Yes _____No _____Not sure

7. Have you generated any educational software of this type yourself?

_____No; if no, what (if anything) would you like to generate?

_____

_____Yes; if yes, what? Were you compensated for your time?

_____

_____

8. Would you make more use of the multi-media equipment if additional appropriate educational software were made available?

_____Yes _____No _____Not sure

E. Student Self-Study Modules

1. Do you prescribe self-study modules at the Technology Learning Center for students? _____Never _____Sometimes _____Frequently

2. On what basis do you assign self-study modules?

3. Do you find, from your experience, that the self-study module is valuable for students needing additional study?

_____No

_____Not sure

_____Yes, for all students

_____Yes, for some students (specify)_____

_____

4. Is there a sufficient number of self-study modules available at NYCCC for the curricula you teach? _____Yes _____No _____Not sure

5. Would you have students make more use of the self-study stations if additional appropriate modules were available for your curricula?

_____Yes _____No

6. Have you created such modules for your students?

_____Yes; if yes, approximately how many? Did you receive some compensation?_____

_____

_____No; if not, do you intend to? With or without some compensation?

_____

_____

GENERAL COMMENTS

Please use this space to give us any overall impressions of the COMET System at NYCCC. Please include student reactions you have noted, as well as any suggestions you might have for improving on COMET's capabilities.

We would appreciate having your name_____
(optional)

APPENDIX C

Student Questionnaire, December 1975

Student Questionnaire - COMET, 12/75

Dear Student,

As you know, this classroom is equipped with special features such as the Student Response System which allows you to respond electronically to questions posed by your professor. We would like to know your reactions to the Student Response System as well as some other computer-assisted classroom aids, and would be grateful for your answers to the following questions.

Since we are not asking for your name, we hope your answers will be honest and complete. Thank you very much for your help.

This Class Section_____

Please indicate your answers by placing a check (√) on the appropriate line and/or writing in your response.

1. About how many class periods did it take for you to learn to use the Student Response System (SRS) comfortably?_____

2. Do you prefer answering questions anonymously through SRS rather than raising your hand in class?
_____Yes
_____No

3. Do you feel that SRS makes you more sure about questions that you know the answer to?
_____Yes
_____No

4. Has the use of SRS changed your willingness to ask the professor questions?
_____No
_____Yes; if yes, are you more or less willing to ask questions?_____

5. Do you ever fail to push a response key when you are asked to?
_____No
_____Yes; if yes, under what circumstances?_____

6. Would you prefer to have classes taught in SRS-equipped classrooms or classrooms without SRS? Please check one.

_____SRS classrooms

_____non-SRS classrooms

_____Makes no difference

Please give specific reasons for your answers:_____

_____

_____

_____

7. Have you ever been asked to write homework or quiz responses on mark-sense cards for computer scoring?

_____No

_____Yes; if yes:

(a) Do you find that having to mark answers on cards takes too much time?

_____Yes _____No

(b) Do you find that having to mark answers on cards affects your accuracy? Please check one.

_____Yes, I become more accurate

_____Yes, I become less accurate

_____No

(c) Do you keep copies of the homework or quiz questions so that you can go over the questions you missed?

_____Always

_____Sometimes

_____Never